

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH

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EDITOR

Recent Advantages in Medical Entomology

By STANLEY B. FREEBORN, Associate Professor of Entomology, University of California, Davis.

A RESUME of the recent "advances" in medical entomology might be characterized (by those who love to have their facts marshalled in orderly and systematic array) more properly as "retreats." One by one we have seen our empirical statements regarding the transmission of disease by insects crumble and disappear as exception after exception crept into the literature to the delight of the investigator and the confusion of the casual observer.

Rocky Mountain Spotted Fever. This febrile disease transmitted by ticks and having its center of endemicity in the Bitter Root Valley of Montana, but appearing as far west as California, occasionally has been the focus of extremely interesting investigations. In addition to the Rocky Mountain spotted fever tick (*Dermacentor venustus*), it is known now to be transmitted by the rabbit tick (*Haemaphysalis leporis-palustris*) which is instrumental in spreading the infection from rabbit to rabbit, thus increasing the number of reservoirs at which the *Dermacentor* ticks may be infected as young ticks to carry the infection over to the larger animals, such as the Rocky Mountain goat and eventually to man.

Studies of the virus show striking differences in its manifestations in the tick and in man. The tick virus, properly treated, has immunizing value for human beings which is lacking in the human virus. The tick virus apparently requires periodic activation in the form of a blood meal. It is present in the salivary glands and feces of infected ticks but

is virulent only after they have been sucking blood for a time. This is of public health significance in that if ticks are removed from human beings at frequent intervals, no infection would take place even though infected ticks had actually been sucking blood for a period of an hour or even slightly longer.

Typhus Fever. This disease, which made the cootie famous during the World War, has also yielded some interesting observations. In the southeastern states, cases of mild typhus have arisen with a baffling epidemiology, apparently being contracted without the assistance of lice which were thought to be essential to its transmission. Studies in the epidemiology of these outbreaks suggest that the carrier is an insect or perhaps more probably a mite that is associated with stored foods, as a predominating number of cases come from those who handle typical grocery-type foods or have their living quarters in close proximity to places where foods of this type are stored. Old World typhus, Brill's disease of New York, the southeastern states' type, and "tarbardillo" of Mexico are all apparently closely related, if not identical, although there are slight differences to be observed in the laboratory findings between the Old World typhus and that which is endemic in the New World.

The Weil-Felix agglutination reaction, long thought to be specific for typhus diagnosis, is now known to be positive for Rocky Mountain spotted fever also, although the latter does not show as great specificity for the standard strain of organism used for the determination in typhus.

Tularemia. Although introduced to the medical world as an insect transmitted disease, the possibilities for direct infection by contact have been demonstrated so numerous that incidence in human beings as an insect or tick borne infection is almost overlooked. Its spread among wild animals in nature is, however, probably largely through the medium of insect vectors; three ticks (the same ones that transmit Rocky Mountain spotted fever and, in addition, the California wood tick), the sucking louse of the rabbit, the sucking louse of the mouse, a deer fly, and the squirrel flea have all been shown capable of spreading the infection from animal to animal and thus increasing the possibilities for man to become infected from one of these sources. In addition to squirrels and rabbits, sheep, meadow mice and quail are known to be capable of infection, and, more recently yet, coyotes infected by eating diseased rabbits have been encountered. One point of human infection for which insects are indirectly responsible is in wool handlers who receive their infection from tick feces left in the wool by infective ticks.

Yellow Fever. With the discovery that certain monkeys could be infected with yellow fever, enormous progress has been made in settling some of the baffling questions that have handicapped man's attempts to stamp out this scourge of the tropics. In addition to the well known yellow fever mosquito (*Aedes aegypti*), long thought to be the only source of transmission, six other species have been shown capable of performing this unwholesome service. The blood of infected monkeys has also been shown to contain a virus capable of infecting a healthy subject through the unabraded skin; a costly bit of information for which three workers at the International Health Board's laboratory in West Africa—Stokes, Young and Noguchi—undoubtedly paid with their lives.

Malaria. Three phases of malaria investigations deserve attention: (1) The biological investigations of the mosquito carriers, (2) the development of plasmochin and (3) the illuminating comparisons of the value of antilarval measures versus cinchonization in Italy.

Biological investigations of the carriers. The discovery that an induced case of malaria would act as a therapeutic agent in general paresis has offered a wide field of observation for students of malaria who were thus furnished with an almost unlimited number of experimental cases under controlled conditions. The most striking observation was the difficulty encountered in actually infecting mosquitoes under the most favorable circumstances. With the most careful technique, it is only possible to bring

one mosquito to the point of infecting a person for every five that are given an infective meal. This emphasized the point so often mentioned in practical control work that the numerical chances of one mosquito fulfilling all the requirements to become a carrier were so small that a reduction in numbers, and not necessarily elimination of *Anopheles*, was all that was needed to produce malaria control. In contrast to this angle, some artificially infected mosquitoes have been used to infect as many as 40 patients over a period of three months, three times the normal span for the average female mosquito. Other interesting observations were that some patients, irrespective of the number of sexual malarial parasites in their blood, invariably failed to produce an infection in any mosquitoes. Also, the number of infective mosquitoes feeding on a patient evidently showed little correlation with the onset of the disease or its severity; one infective mosquito produces an infection in a patient just as quickly and just as severely as a hundred do.

Plasmochin. This German synthetic product hailed by many as a substitute for quinine, had considerable vogue in 1926, but lost much ground as the result of toxic effects produced when administered as originally recommended. Recent investigations have done little to improve its standing as a therapeutic agent, but the remarkable success of small and safe dosages (0.5 centigrams daily) in rendering the patient noninfective to mosquitoes has raised the hope of public health workers that here, at least, is the long sought agent for preventing the spread of malaria even in the presence of an ample supply of anophelines.

Antilarval measures. The work of the Italian government in cooperation with the International Health Board in demonstrating the possibility of accomplishing absolute control of malaria by larvicidal measures alone is of inestimable consolation to those entomologically minded public health workers who have battled for the importance of insect control rather than carrier control in antimalarial endeavors. By controlling the anophelines surrounding two towns, these workers were able to convert veritable pest holes of malaria into summer resorts and nationally recognized health centers in the course of two years. On the other hand, intensive treatment with quinine in another town where the mosquitoes were not controlled, failed to check the disease; in fact, the rate actually increased. It was also observed with considerable satisfaction that in districts where antilarval measures were being used, treatment by quinine was far more effective, explained, no doubt, by the relative freedom from reinfection in these areas.

EXAMINATION FOR LABORATORY TECHNICIANS ANNOUNCED

The next examination for certificates of proficiency for laboratory technicians is scheduled for May 8th in Los Angeles and May 10th in Berkeley.

The subjects of the examination and the relative weights of the subjects on a scale of 100 are: General knowledge of subject, 50; Relative capacity, 16 $\frac{2}{3}$; Experience, 33 $\frac{1}{3}$.

The item "General knowledge of subject" will cover questions relating to knowledge of principles and practice of the subject, particularly as applied in a diagnostic laboratory.

The subject "Relative capacity" will include personality and general education, and will be based on a personal interview and the evidence presented by the paper.

The subject "Experience" will be rated as follows: Seven years' first class experience had within the last ten years in the field covered by the certificate in view, 100 credits; six years, 90; five years, 80; four years, 70; three years, 60; two years, 50; one year, 40. Deductions will be made when, in the judgment of the board, the experience claimed is not first class.

The credit given for laboratory experience depends on whether the laboratory is considered first class for the work covered by the certificate or not. For the bacteriology certificate, the laboratory of the Los Angeles County Health Department and others of like standing would be first class, as also the laboratories of teaching hospitals like those of Stanford and California Medical Schools. For the certificate in biochemistry, experience in public health laboratories would not be first class, but experience in a well conducted clinical laboratory would. The degree A.B. or B.S. with a major in a subject directly related to the field covered by the certificate, and in addition a special course, both institution and course being approved for this purpose by the board, together with a period of practical experience of not less than three months in a laboratory specifically approved for this purpose, will entitle the applicant to credit equivalent to seven years' first class experience. The degree A.B. or B.S. with a major in a subject directly related to the field covered by the certificate, but without the special course and internship described in the preceding paragraph, will be equivalent to two years' experience. Credits for education will be added to credits for actual practical experience in computation of the total.

Those who make a passing grade, but do not give evidence of qualifications necessary for the responsibility of running a laboratory alone, will be given

the junior grade certificate, entitling them to work under supervision only.

Separate examinations are given for, and separate certificates issued for work in serology, bacteriology, parasitology and biochemistry. The latter certificate, for convenience, covers all clinical laboratory procedures not included under bacteriology, serology and parasitology. Each type of certificate entitles the holder to engage in the line of work covered by that certificate only.

Only workers in official public health laboratories and in clinical laboratories approved by the State Department of Public Health are required to hold the certificate of proficiency.

Persons desiring to take these examinations should write to Dr. W. H. Kellogg, Chief, State Bacteriological Laboratory, Berkeley, for application forms. All applications must be mailed on or before May 1st.

SEWAGE DISPOSAL PERMITS PENDING

The following applications for sewage disposal permit are pending before the State Board of Public Health, final action to be taken at the next meeting of the board, to be held in Room 335 State Building, San Francisco, April 12, 1930:

SEBASTOPOL—Application for a permit to dispose of a stable effluent, disinfected or equivalent, into Laguna de Santa Rosa.

STEGE, STEGE SANITARY DISTRICT—Application for permit to dispose of raw sewage into San Francisco Bay at the shore of Point Isabel.

MORBIDITY*

Diphtheria.

54 cases of diphtheria have been reported, as follows: Alameda County 3, Oakland 7, Fresno County 1, Los Angeles County 3, Glendale 2, Los Angeles 14, Pasadena 1, Hawthorne 1, South Gate 1, Willits 3, Monterey County 1, Orange County 4, Anaheim 1, Oceanside 1, San Francisco 5, Redwood City 1, Sonoma County 1, Tulare County 2, Ventura County 1, Oxnard 1.

Scarlet Fever.

182 cases of scarlet fever have been reported, as follows: Alameda 2, Berkeley 2, Livermore 1, Oakland 9, Butte County 1, Colusa County 2, Colusa 1, Contra Costa County 1, Fresno County 4, Fresno 4, Sanger 1, Humboldt County 1, Eureka 3, Susanville 1, Los Angeles County 7, Alhambra 1, Beverly Hills 1, Burbank 1, Compton 2, Covina 1, Glendale 1, Huntington Park 1, Inglewood 1, Los Angeles 53, Pasadena 1, Pomona 2, Redondo 1, San Gabriel 2, Whittier 1, South Gate 2, Monterey Park 1, Bell 1, Merced 1, Monterey County 2, King City 2, Salinas 1, Orange County 2, Santa Ana 3, Riverside 1, Sacramento County 1, Sacramento 4, San Diego County 1, Escondido 2, San Diego 2, San Francisco 26, Stockton 4, Daly City 1, Santa Clara County 5, Siskiyou County 3, Santa Rosa 1, Red Bluff 2, Tulare County 1, Ventura County 4.

Measles.

1901 cases of measles have been reported as follows: Alameda County 2, Alameda 38, Albany 12, Berkeley 12, Emeryville 5, Hayward 1, Oakland 273, Piedmont 3, San Leandro 13, Contra Costa County 17, Martinez 4, Pinole 6, Pittsburg 6, Richmond 1, Fresno County 13, Fresno 32, Calxico 4, El Cen-

*From reports received on March 24th and 25th for week ending March 22d.

tro 4, Los Angeles County 196, Alhambra 5, Arcadia 2, Burbank 1, Compton 2, Glendale 39, Glendora 1, Huntington Park 4, Long Beach 70, Los Angeles 386, Monrovia 3, Montebello 3, Pasadena 29, Pomona 9, Redondo 1, San Fernando 11, San Gabriel 2, San Marino 2, Whittier 1, South Gate 20, Monterey Park 4, Signal Hill 4, Maywood 5, Tujunga 2, Marin County 2, Sausalito 1, Merced County 11, Los Banos 1, Merced 21, Napa 2, Orange County 2, Anaheim 5, Fullerton 4, Huntington Beach 1, Santa Ana 7, La Habra 1, Roseville 1, Riverside County 18, Riverside 10, Sacramento County 4, Sacramento 3, Hollister 1, Ontario 1, Redlands 1, San Bernardino 21, San Diego County 1, Chula Vista 1, San Diego 4, San Francisco 305, San Joaquin County 2, Stockton 17, Tracy 1, San Mateo County 2, Daly City 2, Santa Barbara County 48, Santa Maria 1, Santa Clara County 21, Los Gatos 4, Palo Alto 6, San Jose 39, Santa Clara 4, Sunnyvale 1, Siskiyou County 10, Yreka 10, Benicia 2, Rio Vista 7, Vallejo 18, Sonoma County 5, Santa Rosa 17, Turlock 2, Sutter County 1, Fillmore 2, Ventura County 1, Marysville 1.

Smallpox.

67 cases of smallpox have been reported, as follows: Berkeley 1, Butte County 2, Chico 1, Contra Costa County 3, Fresno County 1, Fresno 1, El Centro 2, Los Angeles County 4, Inglewood 4, Los Angeles 7, Santa Monica 1, Whittier 1, Torrance 1, South Gate 1, Willits 1, Merced County 6, Orange County 1, Riverside County 6, Sacramento 6, Redlands 4, San Bernardino 3, Upland 4, San Diego County 2, Stockton 1, Tulare County 3.

Typhoid Fever.

8 cases of typhoid fever have been reported, as follows: Butte County 1, Los Angeles 1, San Francisco 1, San Joaquin County 3, Santa Barbara County 1, San Jose 1.

Whooping Cough.

202 cases of whooping cough have been reported, as follows: Alameda 3, Oakland 6, Contra Costa County 2, Pittsburg 1, Fresno 7, Los Angeles County 12, Glendale 1, Huntington Park

3, Inglewood 2, Long Beach 19, Los Angeles 36, South Gate 6, Bell 4, Merced County 2, Orange County 1, Anaheim 6, Orange 7, Santa Ana 12, Seal Beach 2, Tustin 2, Sacramento 4, San Bernardino 1, San Diego County 2, San Diego 33, San Francisco 1, San Joaquin County 1, San Luis Obispo County 5, Santa Maria 1, Ventura County 20.

Meningitis (Epidemic).

13 cases of epidemic meningitis have been reported, as follows: Eureka 1, Los Angeles 5, Merced County 1, Merced 1, San Diego 1, San Francisco 3, San Joaquin County 1.

Leprosy.

San Francisco reported one case of leprosy.

Poliomyelitis.

2 cases of poliomyelitis have been reported, as follows: Los Angeles 1, San Diego County 1.

Encephalitis (Epidemic).

2 cases of epidemic encephalitis have been reported, as follows: Richmond 1, San Francisco 1.

Trichinosis.

Santa Clara County reported 4 cases of trichinosis.

Food Poisoning.

6 cases of food poisoning have been reported, as follows: Fresno County 5, Los Angeles County 1.

Undulant Fever.

2 cases of undulant fever have been reported, as follows: Los Angeles County 1, Alhambra 1.

NOTE.—Cases charged to "California" represent patients ill before entering the state or those who contracted their illness traveling about the state throughout the incubation period of the disease. These cases are not chargeable to any one locality.

COMMUNICABLE DISEASE REPORTS

Disease	1930				1929			
	Week ending			Reports for week ending Mar. 22 received by Mar. 25	Week ending			Reports for week ending Mar. 23 received by Mar. 26
	Mar. 1	Mar. 8	Mar. 15		Mar. 2	Mar. 9	Mar. 16	
Actinomycosis	0	0	0	0	1	0	0	0
Botulism	0	0	0	0	0	3	0	0
Chickenpox	676	608	625	672	663	710	719	585
Coccidioides Granuloma	2	2	0	0	3	0	0	0
Diphtheria	67	58	77	54	61	43	61	58
Dysentery (Amoebic)	0	0	0	2	1	1	0	1
Dysentery (Bacillary)	2	0	0	1	0	0	0	0
Encephalitis (Epidemic)	1	1	0	2	5	2	4	2
Erysipelas	21	14	17	18	31	18	23	15
Food Poisoning	0	17	0	6	0	0	0	1
German Measles	45	39	60	32	70	33	36	48
Gonococcus Infection	120	135	154	96	120	126	123	129
Hookworm	0	1	0	0	0	0	0	0
Influenza	46	57	35	34	191	161	117	102
Jaundice (Epidemic)	0	0	0	0	1	0	0	0
Leprosy	0	0	0	1	1	1	0	0
Malaria	0	1	2	1	0	0	0	0
Measles	1,576	1,601	1,909	1,901	46	70	63	57
Meningitis (Epidemic)	13	6	7	13	36	22	19	18
Mumps	818	799	794	898	445	547	570	540
Ophthalmia Neonatorum	0	1	0	0	1	1	1	0
Paratyphoid Fever	0	0	1	0	1	1	0	0
Pellagra	0	1	1	1	4	1	0	1
Pneumonia (Lobar)	83	58	68	42	159	114	102	80
Poliomyelitis	2	3	4	2	2	0	3	8
Rabies (Human)	0	0	1	0	0	0	1	0
Rabies (Animal)	13	22	16	38	33	29	18	13
Scarlet Fever	283	227	219	182	570	534	552	473
Smallpox	109	68	114	67	106	77	89	37
Syphilis	175	197	249	175	126	221	153	161
Tetanus	4	1	4	1	2	0	0	4
Trachoma	2	2	0	2	3	1	2	1
Trichinosis	4	0	0	4	0	1	0	0
Tuberculosis	145	272	214	209	218	278	250	229
Typhoid Fever	5	10	8	8	16	15	6	13
Undulant Fever	1	1	3	2	1	1	3	0
Whooping Cough	183	179	176	202	233	210	262	271
Totals	4,396	4,381	4,758	4,666	3,150	3,221	3,177	2,847



Measles continues on its elevated plane.



Mumps is more prevalent.



Animal rabies jumped to 38 cases reported last week.



Epidemic meningitis is persistent in its continued prevalence.

